# Mu2e CO2 Leak Test Update

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Aug 10th

Apparatus at UMN

- 4 working chambers can are being used for measuring leak rate.
- 5 detectors can be read simultaneously. The fifth chamber will be built this week. (The resistance between detectors and Arduino chip should not larger than 1 ohms, otherwise the detectors will be failed to read simultaneously)
- Bar code scanner and Dan Ambrose's bar code python program is working well now.
- Calibration test has been done on 4 chambers.

Calibration test results

4 chambers calibration test result
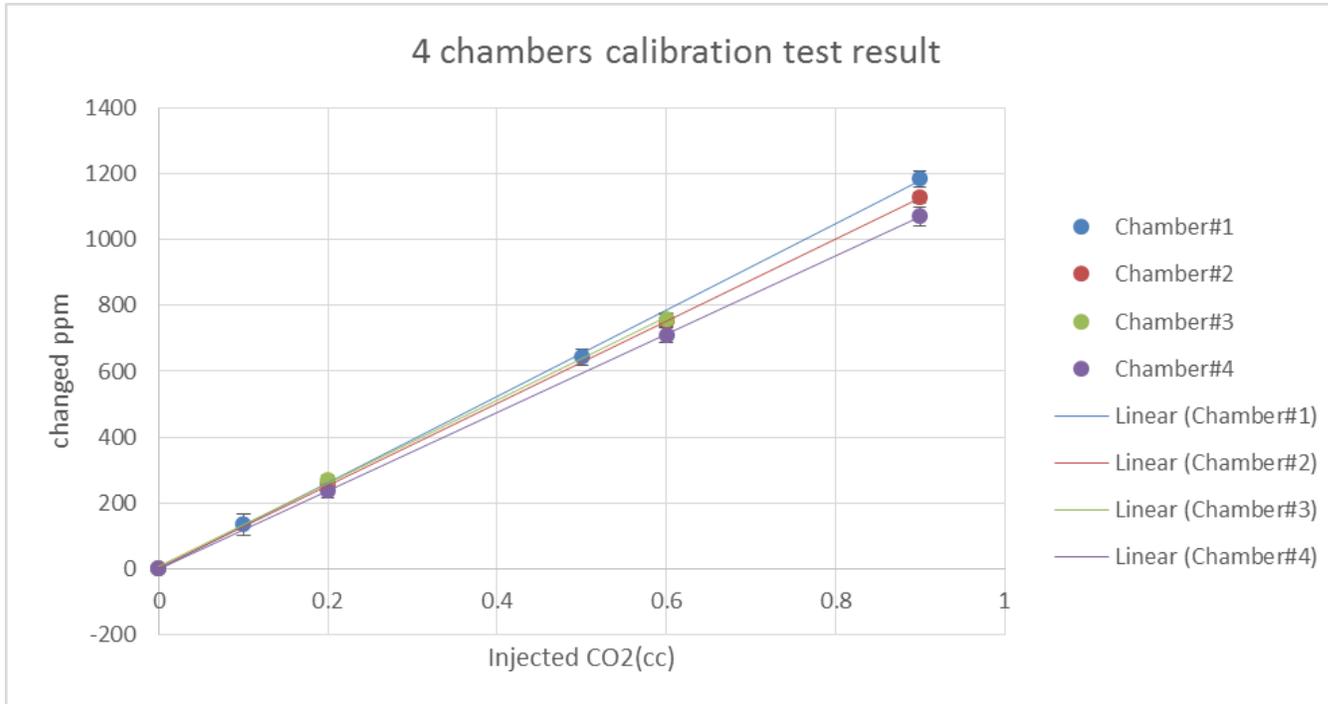
- Volume been estimated by geometric method is larger than injection method.
- We will do the volume estimate using liquid method this week.

Results Without count in (0,0)			Results with(0,0)		geometric method
Chamber	volume	uncertainty	volume	uncertainty	volume
#1	380	14	382	7	466
#2	403	11	399	6	461
#3	407	19	391	9	454
#4	422	19	422	9	455

Viton is the main reason of the straw "memory"
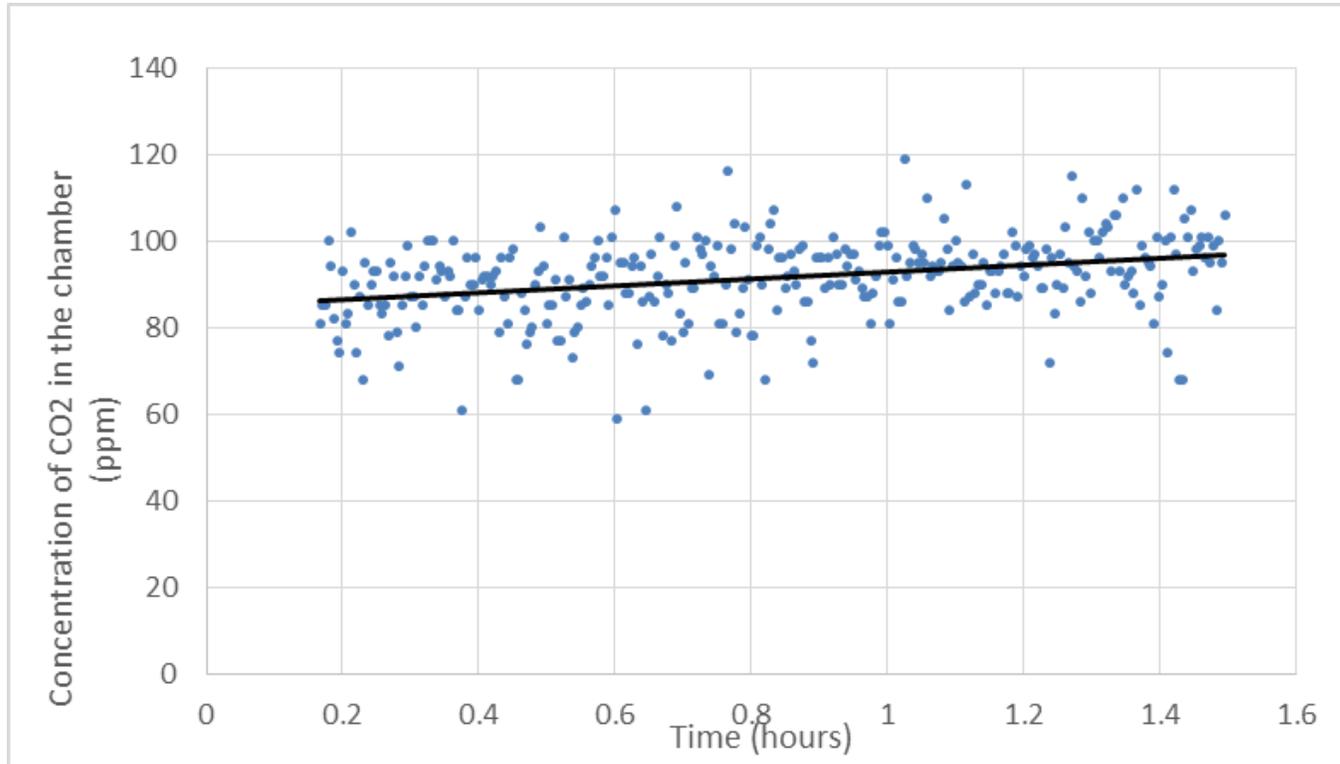
- A straw was left to desaturate for 1 day after the measurement. Then it was tested after being sealed without flush with CO2. The figure on the left shows the leak rate is $6 \times 10^{-5} cc/min$ which means there is still CO2 left inside the straw.

- Our guess is CO2 left inside the straw let the viton keeps bathing in CO2. Therefore viton cannot desaturate before CO2 gone.

Consistency test result
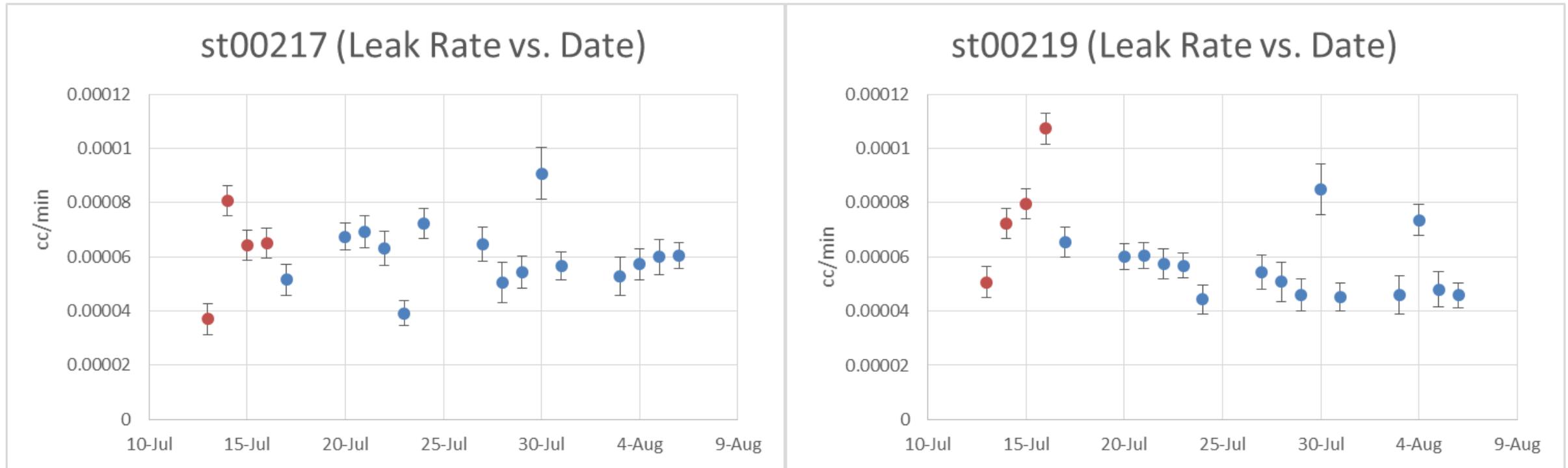


st00217 standard deviation after been flushed N2: 1.2E-05   st00219 standard deviation after been flushed N2 :1.2E-05

- St00217 and st00219 have never been measured before these measurements.

- St00217 and st00219 has been flushed with N2 each time after measurement after the fourth measurement. Red points in figures show the result without flushing N2. Blue points show results with N2 been used.

- No memory things happened again if flushed the straws with N2.

There are a few jumps
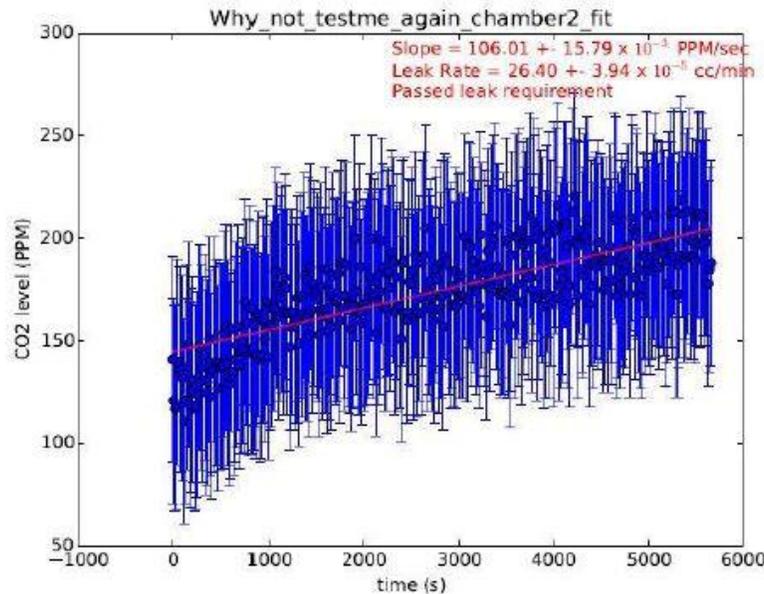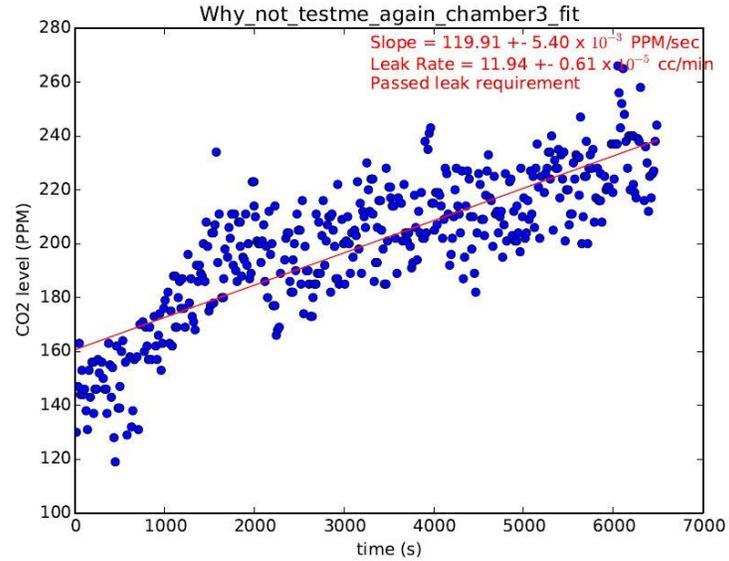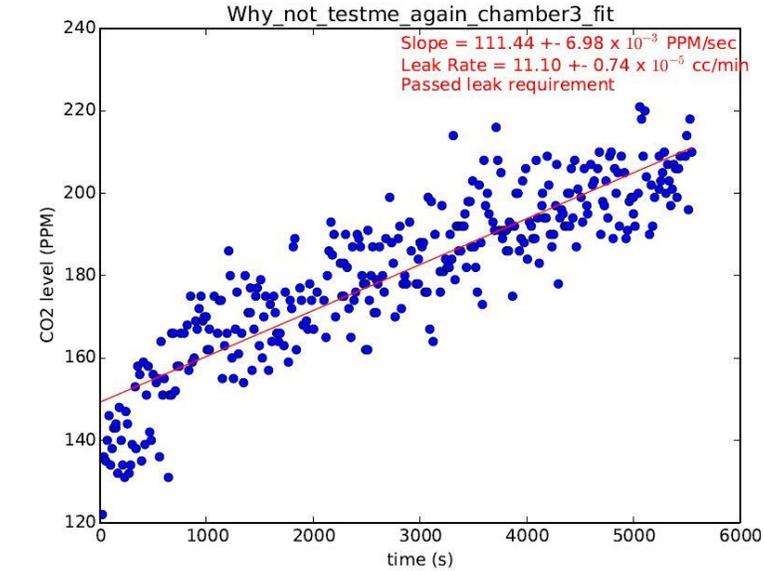
- Upper left: Jul 30th st00217
- Upper right: Jul 22nd st00217
- Bottom left: Jul 21st st00215 leak rate should be divided by 2.5
- The reason of "Jump" is unknown

Consistency test result
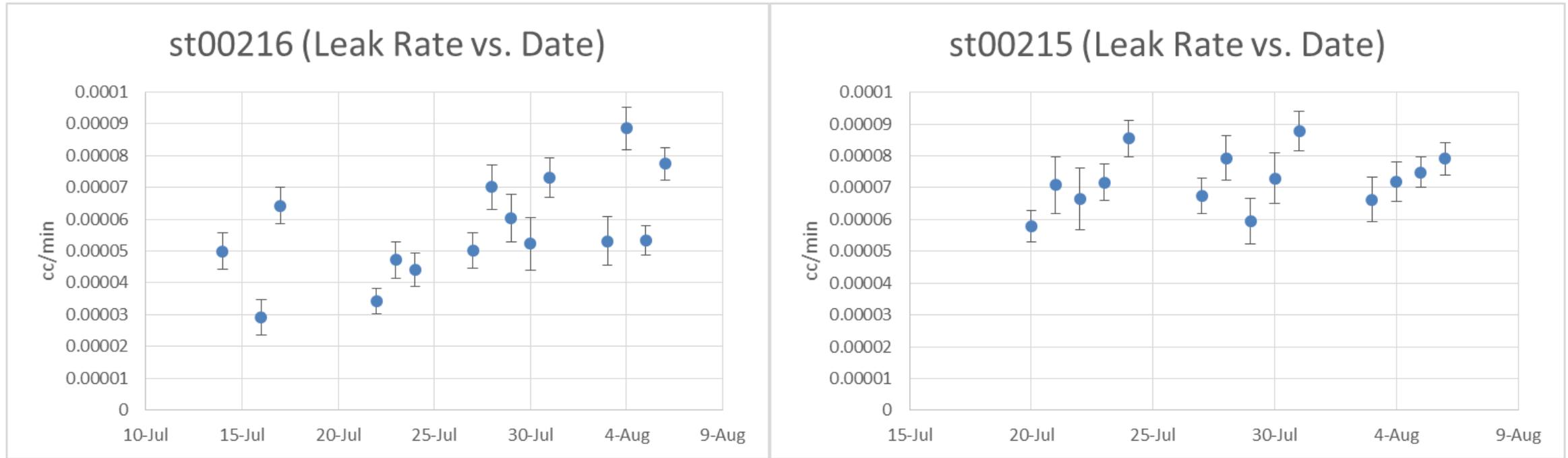
st00219 standard deviation: 8.7016E-06

- St00215 and st00216 have never been measured before these measurements.
- St00216 has been replaced viton every other day. St00215 has been replaced viton everyday. Viton was left for desaturation for 1~2 days.
- The standard deviation of results by replaced viton is smaller than results by flushing with N2.
- Talk about the "memory" happened on st00215? If so, keep next slide. If not, place it after calibration test.

Viton desaturation result

CO2 release from viton tube
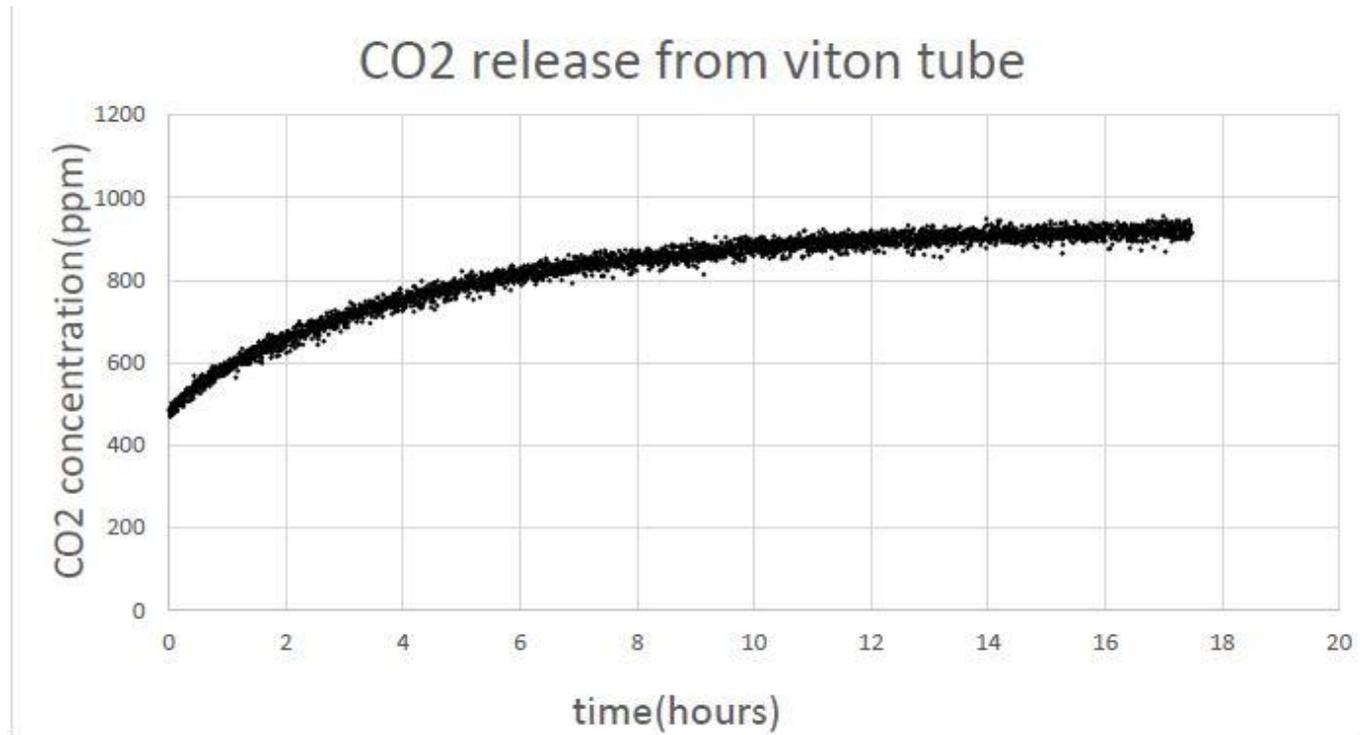
- The result is from a saturated 70cm viton tube. Viton has been pressurized with CO2/Argon mixture for about a day.

- Viton should be desaturated after 24 hours.

- Because the viton was left for desaturation for 1~2 days before being used for the next measurement for st00215. Therefore the viton should desaturated before that. So The memory thing maybe not all result from the viton tube keeps bathing in CO2?

Short straws leak test results

straw number	leak rate* 10^(-5) ccm	uncertainty 10^(-5)ccm
#1	0.268	0.696
#2	0.692	0.684
#3	0.316	0.548
#4	0.872	0.548
#5	1.608	0.544
#6	0.012	0.544

- 6 short straws have been made for leak test the end part of straws.
- Each straw has the length of 16mm. After the end pieces been glued on the straw, there is no space between two end pieces.
- The result shows the leak from the Mylar is the major part of the CO_2 leak

Plans for coming weeks

- Build the fifth chamber this week and do background test and calibration test on it.

- Build or buy a shelf for storing straws.

- Get ready to leak test many straws.